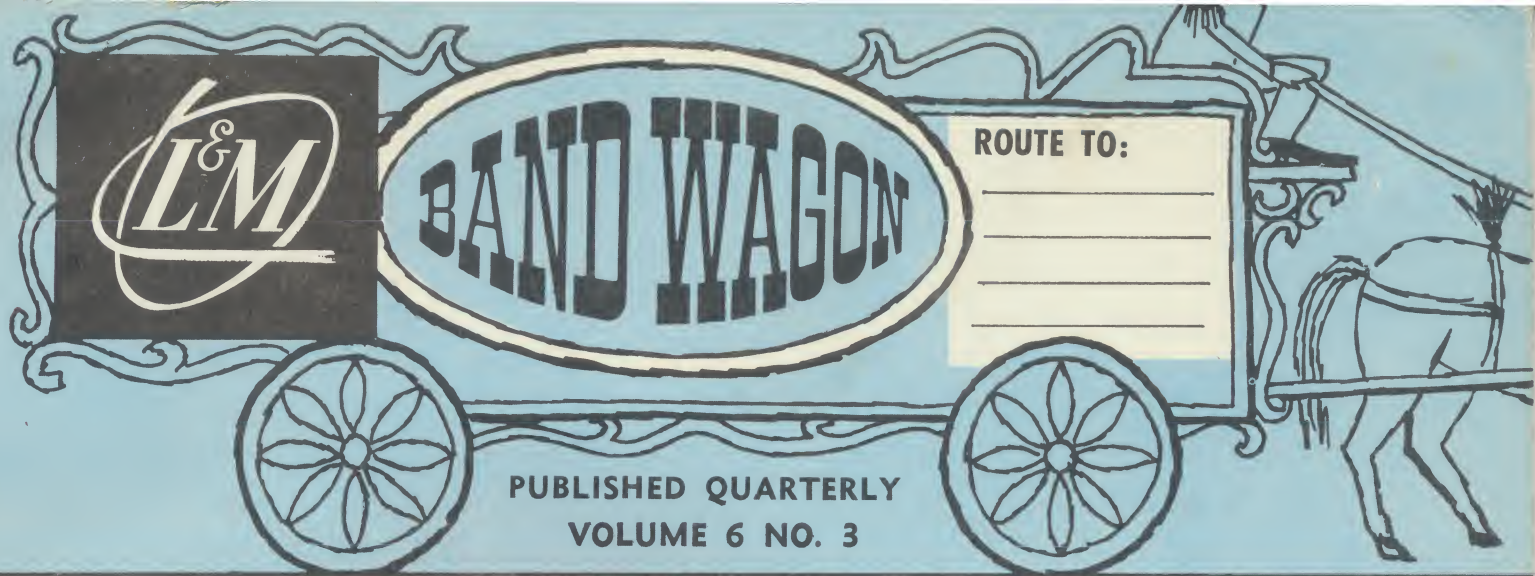




X E T E X

5MHz TIMER COUNTER PRICE \$495



The TC7 is an entirely new four digit instrument capable of frequency measurements up to 5MHz at less than 100mV r.m.s. Facilities are also included for the measurement of period and time and for the counting of random or regular pulses. A 100kHz standard accurate to one part in 10^5 is built-in, with provision for substituting an external standard.

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AROUND THE CIRCUIT

The **IEEE** Show of 1967 is by now just a memory. Sales Meetings are over, demonstration equipment has been returned to inventory (or lost in transit), and exhibit booths have been dismantled and retired to mothballs for another 12 months.

We didn't hear the final registration count; but few booths were empty, many were crowded, and general comments on the show were quite favorable. New products and techniques featured by many manufacturers were indication of the unbelievable rate at which our engineering technology is progressing.

L & M Associates has moved its **Philadelphia Office** to a new central location in **Andalusia, Pa.**, in order to better serve its many customers.

Bill Drobile, L & M Associates, Pennsylvania, can now be reached by dialing (215) 637-3100. Mailing address is 965-A Bristol Pike, Andalusia, Pa.

Those engineers who were unable to attend the recent **L & M Weld Workshop**, will welcome the news that a mobile demonstration caravan sponsored by **Electronic Design News**, and having a 5' x 8' space in the van devoted to **Hughes** welding equipment, will be in the **L & M** area late this summer. Each weld station will be operational, the van being self contained; including electrical power and air conditioning. An **L & M** engineer will be on-hand to discuss the **Hughes** equipment.

L & M Associates is pleased to announce its appointment as Sales Representatives for **Alban Electronics**, Englewood, New Jersey, a newly formed division of **English Electric Corp.** **Alban Electronics** will offer a new range of low cost test and measuring equipment including counters Push Button Signal Generators, AC/DC Digital Voltmeters, and battery operated UHF Millivoltmeters. Service and spare parts available at Englewood, N. J., and all units are covered by a 12-month guarantee on parts and labor.



Bill Hill, Hughes Aircraft Company, lecturing at the L & M Welding Workshop.

Our hearty congratulations and best wishes to **Keith Elkins**, newly appointed Sales Manager for **Marconi Instruments**, Englewood, N. J.

Lou Della Penna, President, **Microwave Components and Systems**, Monrovia, Calif., has announced the appointment of **L & M Associates** as local Sales Representatives. **MCS** manufacturers an extensive line of Microwave waveguides and components in the range from 2.6 GHz to 90 GHz. **MCS** operates under the able direction of General Manager "**Bill**" Purdy, well-known veteran in the microwave field.



During the week preceding the **IEEE** Show, **L & M** joined with **Hughes Aircraft** on this area's first purely educational **Welding Workshop**. Representatives from most of the major companies and many smaller ones comprised this group of 96 paying guests to the two-day session. Although, for obvious reasons, only **Hughes** equipment was used in the seven different work stations, the emphasis was on the techniques and problems of welding in general, rather than the merits of one manufacturer's equipment over another. In part, there was great

reluctance to even give prices when requested. Indicative of the interest was the fact that although the first day's formal activities were scheduled to run from 8:30 A.M. to 4:30 P.M. those who had come down with specific problem to discuss with the **Hughes** experts didn't get out until midnight. We are very grateful to **Dee Blough** and **Buzz Rollins** for their fine efforts and particularly to **Bill Hill**, the Chief Engineer of **Hughes Welding**, whose vast knowledge and logical and pleasant method of presentation resulted in an extremely informative and well received program.

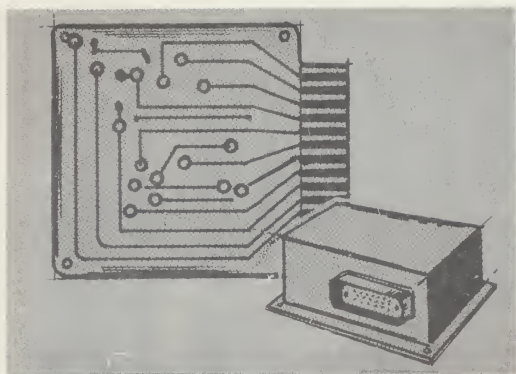


John Verbeck of Vector and Len Blakely of L & M Associates, discussing the progress of the L & M Welding Workshop.

We at **L & M** feel a debt of gratitude to **John Figliozzi** of **IBM** and **John Verbeck** of **Vertol** for their fine lectures and assistance with the Laboratory activities at the **L & M Welding Workshop**.

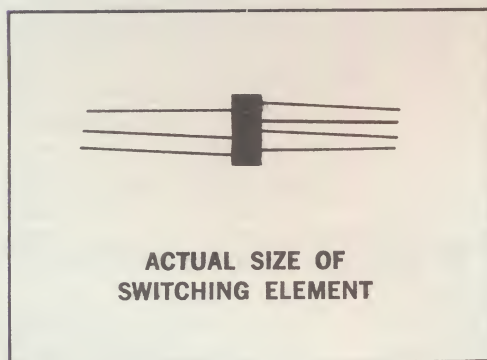
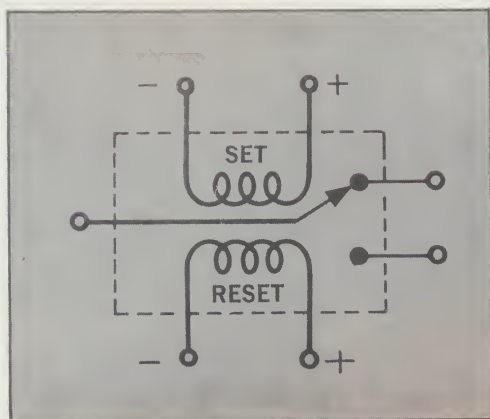
This month we are departing from the usual format followed in the **Discu-Tech** column. We think it might be fun to share with you some of our moments at the **IEEE** Show. The pictures were taken at various booths at the Show. In addition we have included several pictures taken at the **L & M Welding Workshop**. Perhaps your picture is among them; perhaps you recognize somebody with whom you are acquainted.

(Continued on page 7)



NEW MICROMINIATURE SWITCHING ELEMENT CREATES COMPACT, VERSATILE MATRICES AND RELAYS

TROMPETER ELECTRONICS announces an additional series of **LOW FREQUENCY** matrices, switches, relays and logic blocks, based upon a new microminiature switching element to be used in their manufacture. The size of the encapsulated switching element, permits a far greater number of units packaged per square inch than previously possible. The basic switching mechanism is a mercury film contact, Form C (single pole-double throw) with extremely low contact resistance (approximately 25 milliohms). Two separate pulse operated driving coils are available which can be used in a number of different control or logic circuits for single or dual coil control (set — reset, etc.) and can be latched in either throw. Once switched, the circuit is maintained through a magnetic latching mechanism that does not require any power to maintain the latch. The basic switching element is diagrammed and pictured below:



SWITCHING ELEMENT SPECIFICATIONS

TYPICAL CONTACT SWITCHING CAPABILITY

- a) Dry circuit to 50 ma. up to 100 volts.
- b) 250 ma. up to 25 volts.
- c) 2 amps up to 6 volts.

Operate Time:	1 millisecond
Bounce:	None
Life:	50 million minimum
Switching Frequency:	Up to 200 operations per second
Contact Resistance:	Less than 50 milliohms

COIL CHARACTERISTICS:

Resistance:	22.5 ohms
Pulse:	3 volts at 2 milliseconds nominal

ENVIRONMENTAL CHARACTERISTICS:

Operating Temperature:	-38°C to ±100°C
Vibration:	10G sine to 2000 Hz in all planes
Acceleration:	30G sustained in all planes
Shock:	10G for 6 ms in all planes.
Operates in any position.	

The completed matrices and switching devices to be made can handle all types of **low frequency** signals; such as audio, analog and digital voltages for use in telephone, computer, telemetry, teletype and instrumentation systems (1, 2 or 4 wire). Extremely small matrices can be supplied as replacements for mechanical crossbar switches where the mechanical type is too big or costly when only a small quantity of crosspoints are desired.

For the present, matrices, sequencers and other switching devices are to be made to customer order and requirements. Please contact our Sales Department or your local representative for further information and quotations on your needs.



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Ralph Tschirschnitz and Joe Kamenshine of SKF discussing welding problems with John Figliozzi of IBM, at L & M welding workshop.



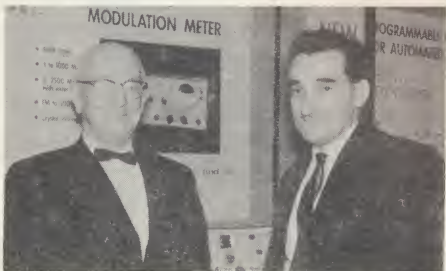
Lunch time at L & M Welding Workshop.



Herb Brumbach of RFL Industries, Inc., describing the new Model Three Hundred Calibrator to L. R. Drake, Bendix Corp., Mountaintop, Pa.



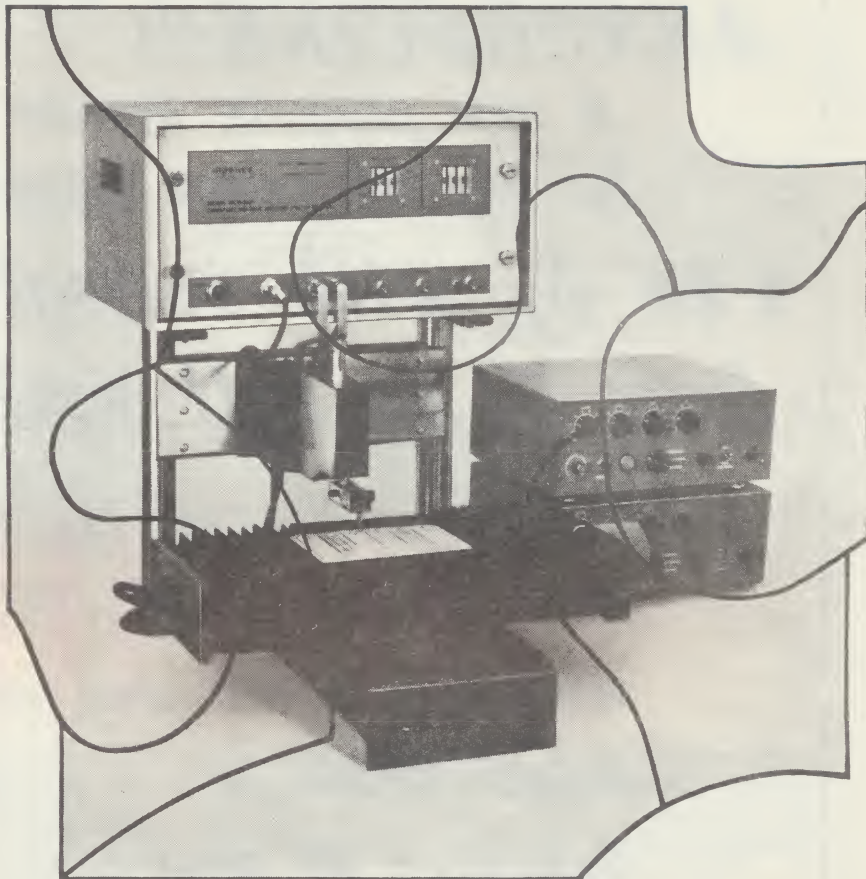
Sam Adler, Dow Chemical Company, learning about the new Victoreen Proximity Voltmeter from John Drummond, Victoreen Sales Mgr.



Len Blakely, L & M Associates, meets old friend Bob Groom, Telequipment, London,

(Continued on page 11)

Fit them together for your needs...



Hughes Welding/Soldering/Positioning Systems

If you are ready for automated assembly, Hughes now offers a whole family of production systems you can custom-fit to your requirements. Just take your pick of the finest electronic welding and soldering equipment, numerical control positioning systems, XY slide tables—and you're in business.

Take the model HXY-410 system (pictured), for example. This system combines a 10x10 XY slide table with stepping motors and 2 axis controls, Hughes MCW welding/reflow soldering equipment including dynamic regulating power supply, bonding head and actuator and binocular microscope viewing aid. Applications include termination of memory plane wires, attachment of lead frames to hybrid substrates or welds of complex wire matrixes.

Then there is a whole group of other systems from the HXY-110, a low cost system for use with quick-shift tooling for straight-line indexing, on up to the HXY-510 with fully automatic 2 axis table and Hughes field-proven numerical controls.

And if none of these systems quite suits you, we will put one together that does.

If you would like to get better acquainted with Hughes new automated welding / soldering equipment, call or write HUGHES WELDERS, 2020 Oceanside Blvd., Oceanside, California 92054. For export information, write Hughes International, Culver City, Calif.

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*1 kc h_{fe} with collector currents
from 10 μ a full scale to 100 ma*

Collector voltages: up to 30 volts

Beta ranges: 10, 30, 100, 300, 1000, 3000

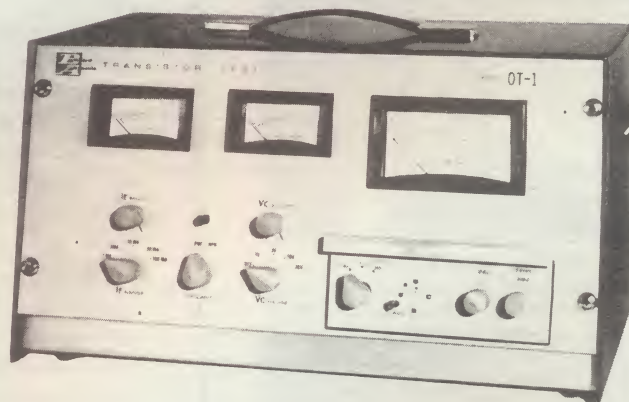
Accuracy: $\pm 3\%$ full scale

Price: \$950

Delivery: 90 days

HIGH FREQUENCY TRANSISTOR OT SERIES TEST SET

Each instrument in the OT Series of High Frequency h_{fe} (beta) Transistor Test Sets is a self-contained unit for the measurement of transistor gain, h_{fe} (beta), under high frequency operating conditions. The use of one of three standard plug-in units permits testing at 20, 100, or 200 megacycles per second. Plug-in units for testing at special frequencies, as well as plug-in units to measure other parameters, may be obtained. Separate meters are provided to read collector voltage, V_e , emitter current, I_e , and gain, h_{fe} . Each instrument, therefore, is suitable for laboratory testing and for the high speed testing required by production or incoming inspection.



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LOW VSWR CONNECTORS

reprinted from Alford Mfg. Co. Catalog "N"

General

There exists a great variety of cable connectors. Many of these are made in large numbers with relatively wide tolerances and are not believed to be intended for use in accurate measurements in an electronic standards laboratory. And yet time and again there arises a situation in which one desires to know how accurately one can measure a load with, say, a Type N or a Type TNC or some other cable connector. The answer to this question is not always simple because many of the well known connectors are rather complex RF circuits which introduce mismatches of their own that are sometimes greater than the quantities to be measured through them.

For this reason, in early 1963, Alford Manufacturing Company undertook a detailed study of several types of widely used connectors. A summary of the results of the study of MIL-C-71 Type N connectors was first published in the AMCI Instruments and Components Catalog L, in early 1963, and is in part, reported here.

Type N Connectors as specified by MIL-C-71

The study of Type N connectors constructed in accordance with MIL-C-71 was performed with the aid of an accurately-made, scale model.

The various dimensions of this model were obtained by multiplying by scaling factor $S=3.619$ the nominal dimensions (with zero tolerances) of the Type N Connector as described in MIL-C-71. Some of these dimensions before being multiplied by S are given in Figure 1a.

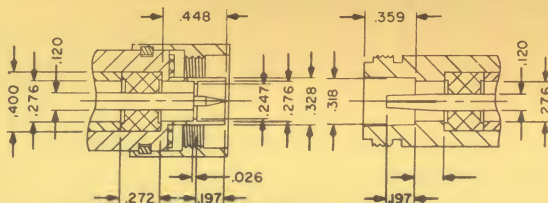


Fig. 1a. Nominal dimensions (with zero tolerances) of the Type N Connector as described in MIL-C-71.

In the initial test the plug and jack shown in Figure 1a were connected together to form what will be referred to as a Type N Union. The plug of Figure 1a was connected to a carefully matched 0.2763/0.1200* coaxial line and the impedance looking into the jack was measured.

To start with, the gap G in Figure 1b was 0.026 inch ($0.026 \times S$ in the model). This was the distance between the end of the Slotted pin in the jack and the beginning of the 0.120 inch diameter inner conductor in the Plug. The SWR obtained under these conditions is as shown in Figure 2a.

Except for some variations in SWR due to relatively minor changes in the insulating beads which are used in connectors with the several different sizes of cables, the SWR shown in Figure 2a was believed to be the contribution of a "zero tolerance Type N Connector Union."

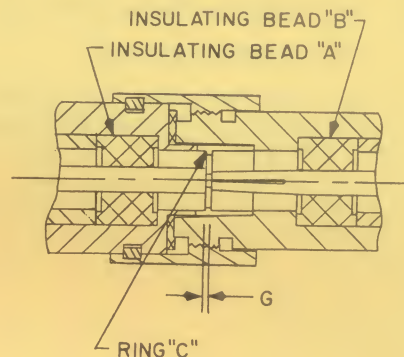


Fig. 1b Type N union per MIL-C-71.

When various dimensions of the connector were varied within their specified tolerances a variety of SWR curves were obtained; the curve in Figure 2a may be (somewhat loosely) regarded as an average curve of the MIL-C-71 Union.

In Figure 2b is shown the SWR of the Type N union of Figure 1b with insulating beads A and B removed and replaced with 0.2763/0.1200 coaxial air lines.

From a comparison of Figure 2b with 2a it would appear that the two beads together superimposed an SWR up to about 1.04. This was not the case. The combined reflection due to the two beads was actually greater than the reflection due to the remainder of the connector. The two reflections, however tended to partially cancel each other.

AMCI Type NR Connector

As a result of this investigation, the Alford Manufacturing Company developed several improved Type N connectors one of which was designated Type NR.

1) The inner conductor slotted pin on the AMCI Type NR Jack, is designed to compensate for the increase in impedance which would otherwise be caused by the slots in the pin.

2) The setback of the slotted inner conductor pin is made 0.214 inch which corresponds to a gap $G=0.009$ inch. It had been found that the capacitance introduced by the compensating outer conductor ring C in the MIL-C-71 plug, see Figure 1b, just compensates for a gap $G=0.009$ inch, but not 0.026 inch.

*0.2763/0.1200 represents a co-axial transmission line having a 0.2763 inch inner diameter of outer conductor and a 0.1200 inch outer diameter of inner conductor. The characteristic impedance of such a transmission line is 50.00 ohms.

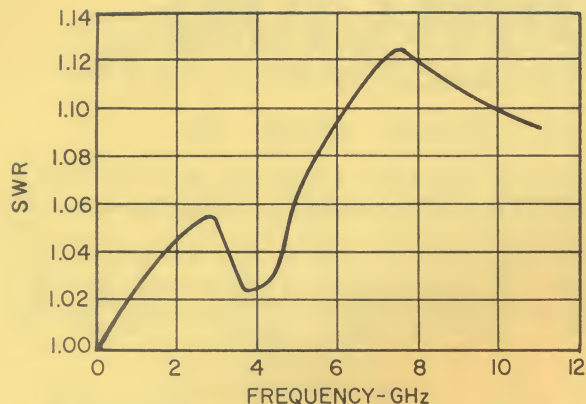


Fig. 2a SWR of a zero tolerance type N union per MIL-C-71. Data shown was obtained from an experimental model. (See Text.)

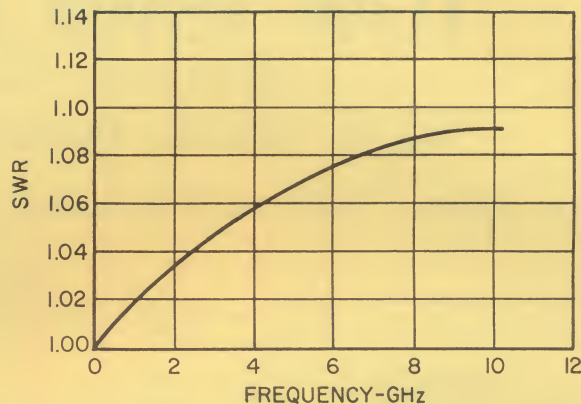


Fig. 2b SWR of a zero tolerance Type N Union with insulating beads A and B removed. (See Fig. 1b.) Data shown was obtained from an experimental model. (See Text.) *

3) The setback of the inner conductor pin in the AMCI Type NR Plug was revised from 0.223 inch to 0.206 inch. The effect of this change was to decrease the gap G between the end of the slotted pin in the MIL-C-71 connector half of the union and the 0.120 inch inner conductor diameter in the AMCI Type NR plug from the usual 0.026 inch to 0.009 inch.

4) The slotted outer conductor of the plug is made with a small 0.328 inch diameter contact ridge on its outside surface. This ridge in combination with the slotted fingers helps to ensure positive repeatable contact between the outer conductor of the plug and the 0.318 inch diameter counterbore in the MIL-C-71 Jack.

The SWR of an AMCI Type NR Jack mated with a MIL-C-71 zero tolerance Type N plug is shown in Figure 2c. The SWR of a Type NR Plug mated with a zero tolerance Type N Jack is less than the SWR of a MIL-C-71 zero tolerance Type N union but is not as low as the SWR of an AMCI Type NR Jack mated with a MIL-C-71 zero tolerance Type N plug.

The Revision of the Type N Connector; MIL-C-71 is Replaced by MIL-C-39012

In due course of events the nature of the shortcomings of the MIL-C-71 Type N Connector came to be appreciated by both Government and industry. As a result, the National Bureau of Standards has specified, that on equipment submitted for test or calibration, equipped with Type N connectors, the connectors be modified as follows: The Type N Jacks shall have a setback of 0.207 inch plus 0.000, minus tolerance. Type N Plugs shall have a setback of 0.207 inch, minus 0.000, plus tolerance.

If such connectors with zero tolerances are joined in a union the gap G is zero and the usual

0.026 inch compensating ring on the outer conductor is not required. When the 0.026 inch compensating ring is used 0.009 inch should be added to the 0.207 inch setback dimension of the plug.

This announcement by the National Bureau of Standards, in effect, encourages the manufacture and use of revised Type N connectors which would not only mate with each other but also would result in improved performance when mated with the MIL-C-71 Type N connector.

Essentially the same thoughts are included in the new Military connector specification MIL-C-39012 and its additions. The only difference seems to be that the minimum setback dimension for the MIL-C-39012 Class II plug is 0.210 instead of 0.207 so that there is a minimum gap G of 0.003 inch.

AMCI Type NB/P Connector.

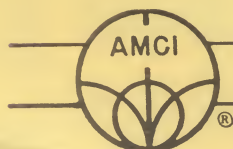
For use with revised Type N connectors such as the MIL-C-39012 Type N connector, the Alford Manufacturing Company has developed the AMCI Type NB/P connector. The AMCI Type NB/P connector has the following important features:

1) The slotted outer conductor of the plug is made with a small 0.328 inch diameter contact ridge on its outside surface. This ridge in combination with the slotted fingers helps to ensure positive repeatable contact between the outer conductor of the plug and the 0.318 inch diameter counterbore in the Jack.†

2) The setback dimensions of the AMCI Type NB/P Jack and Type NB/P Plug are 0.207 inch, plus 0.000, minus 0.002, and 0.207 inch, plus 0.002, minus 0.000 respectively. If zero tolerance Type NB/P connectors are joined in a

*Data in Figures 2b, 2c, and 2d taken from connector models without insulating beads.

†The counterbore in the AMCI Type NB/L Jack is made 0.328 inch in diameter. The outer conductor fingers of the Type NB/P Plug should therefore be spread prior to joining an AMCI Type NB/P Plug and an AMCI Type NB/L Jack.



ALFORD MANUFACTURING COMPANY

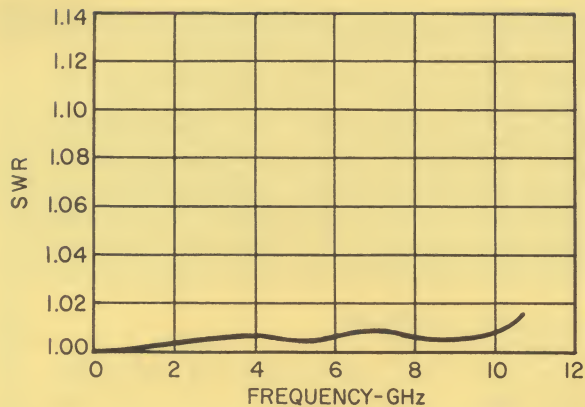


Figure 2c. SWR of an AMCI Type NR Jack mated with a MIL-C-71 Type N plug. Data shown was obtained from an experimental model (see text).* AMCI Type NR connectors are designed to mate with the MIL-C-71 Type N connectors, but not with each other.

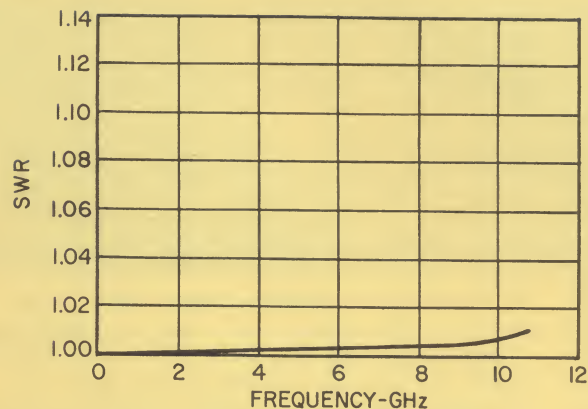


Figure 2d. SWR of an AMCI Type NA Jack mated with a MIL-C-71 Type N plug. Data shown was obtained from an experimental model (see text).* AMCI Type NA connectors are designed to mate with MIL-C-71 Type N connectors, but not with each other.

union, the gap G is zero and the usual 0.026 inch compensating ring on the outer conductor is not required.

3) The inner conductor slotted pin on the AMCI Type NB/P Jack is designed to compensate for the increase in impedance which would otherwise be caused by the slots in the pin.

Measurements indicate that the electrical performance of the AMCI Type NB/P union is at least as good as the performance of the previous AMCI Type NR connector mated with the MIL-C-71 Type N zero tolerance connector. See Figure 2c.

The SWR of an AMCI Type NB/P Plug mated with a zero tolerance MIL-C-39012 Jack, assuming perfect insulating beads, would be similar to the SWR introduced by an NB/P union provided

that the slotted inner conductor pin in the MIL-C-39012 Jack were made so that the effect of the slots were compensated and that the outer conductor of the plug were equipped with a contact ridge to ensure positive electrical contact at the ends of the outer conductor fingers.

When a class II MIL-C-39012 zero tolerance Type N Plug is mated with an AMCI Type NB/P Jack, there is a built-in 0.003 inch gap between the outer surfaces of the two inner conductors. Within this gap, the inner conductor diameter is 0.065 inch. The effect of this gap is to increase the SWR by about 1.02 at 11GHz and by about 1.03 + at 17 GHz.

AMCI NB/L and Type NA Connectors.

In the course of developing the AMCI Type NR and NB/P connectors the Alford Manufacturing Company developed several other styles

*Data in Figures 2b, 2c, and 2d taken from connector models without insulating beads.

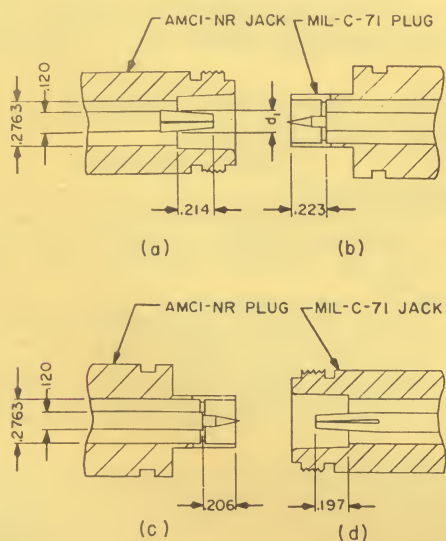


Fig. 3 Detail of AMCI Type NR connectors. AMCI Type NR connectors are designed to mate with standard Type N connectors (per MIL-C-71), but not with each other.

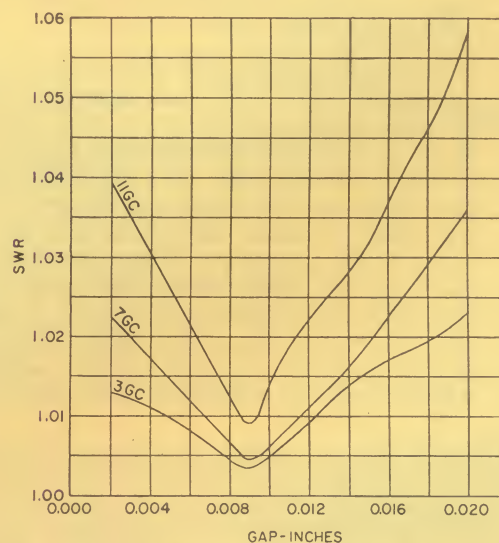


Fig. 4 SWR of AMCI Type NA and NR connectors vs. the gap G between the end of the slotted pin and the 0.120 inch diameter inner conductor in the plug.

of special purpose improved Type N connectors. These connectors were designated Type NB/L and Type NA. The AMCI Type NB/L connector has the following features:

The counterbore in the outer shell of the Type NB/L Jack is made 0.328 inch in diameter. The slotted outer conductor of the Type NB/L Plug is made with a small 0.328 inch diameter contact ridge on its outside surface. Thus there is no encroachment under zero tolerance conditions of the outer conductor fingers into the air space between the inner and outer conductors in an AMCI Type NB/L union. The inner conductor setbacks are also designed so that there is a minimum gap between the 0.120 inch diameters of the inner conductors in an AMCI Type NB/L union. The AMCI Type NB/L connector is similar in most other details to the AMCI Type NB/P connector previously described.

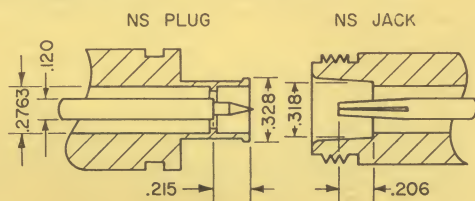


Figure 5a. Dimensional details of the AMCI Type NS connector.

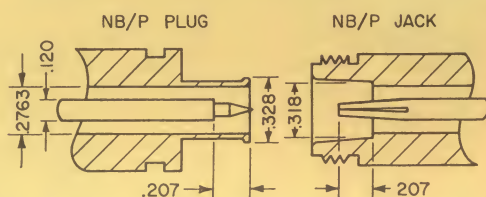


Figure 5b. Dimensional details of the AMCI Type NB/P connector.

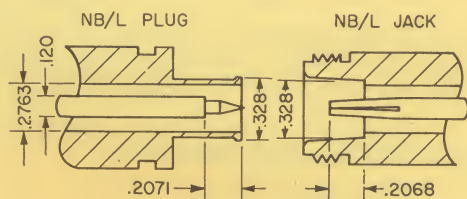


Figure 5c. Dimensional details of the AMCI Type NB/L connector.

The AMCI Type NA connector is similar to the AMCI Type NR connector with the exception that the counterbore in the outer shell of the Type NA Jack is made 0.328 inch in diameter instead of 0.318 inch. The diameter of the contact ridge on the outer conductor of the Type NA Plug is made 0.318 inch instead of 0.328 inch. These changes in diameter result in an almost smooth outer conductor when the AMCI Type NA connector is joined with the MIL-C-71 zero tolerance plug. The AMCI Type NA connector is similar in most other details to the AMCI Type NR connector previously described.

The AMCI Type NB/L and Type NA connectors are recommended only for special tests. They are not recommended for everyday use with either MIL-C-71 or MIL-C-39012 Type N connectors because the contact between the outer conductor fingers of the plug and the inner diameter of the counterbore in the jack is not always assured unless the outer conductor fingers are spread prior to joining the connectors.

AMCI Type NS Connector

The AMCI Type NS connector, shown in Figure 5, is similar to the AMCI Type NR connector previously described except that the Type NS Jack and Type NS Plug setback dimensions are 0.206 inch and 0.215 inch respectively. This results in improved electrical performance not only when Type NS connectors are mated with each other, but also when Type NS connectors are mated with the MIL-C-39012 Type N connector. AMCI Type NS connectors are completely interchangeable with AMCI Type NB/P connectors.

	PLUG	MIL-C-71	MIL-C-39012 CLASS II	AMCI NR	AMCI NB/P	AMCI NS	AMCI NA	AMCI NB/L
JACK								
MIL-C-71								
MIL-C-39012 CLASS II								
AMCI NR								
AMCI NB/P								
AMCI NS								
AMCI NA								
AMCI NB/L								

REVISÉ TYPE N UNIONS
 TYPE N UNION PER MIL-C-71
 MECHANICALLY POSSIBLE WITH REDUCED ELECTRICAL PERFORMANCE
 MECHANICALLY IMPOSSIBLE

The SWR of an AMCI Type NS connector mated with a MIL-C-71 zero tolerance Type N connector is less than the SWR of a zero tolerance MIL-C-71 Type N union but is not as low as the SWR of an AMCI Type NB/P union.

Reducers to "Type N" connectors for slotted lines will be available with both NR and NB/P connectors. The NR connectors are recommended for use with the MIL-C-71 Type N connectors and the NB/P connectors are recommended for use with the improved Type N connectors, including those called for by MIL-C-39012.

Summary of AMCI Type N Connectors

AMCI Connector Type	Suggested Application
NR	For use on measuring equipment when mating with MIL-C-71 type N connectors only. AMCI type NR connectors will not mate with each other.
NB/P or NS	For use with revised type N connectors such as the proposed MIL-C-39012 type N connector.
NB/L	Special uses where a high precision connector with a smooth outer conductor joint is desired.



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- 48 lead test

Test Capability (choose 1)

- 1-20 tests, solid state logic
- 1-40 tests, solid state logic
- 1-60 tests, solid state logic
- unlimited tests, data or go logic

Programming Input (choose 1)

- | | |
|----------------------|---------------|
| printed circuit card | IBM card |
| manual peg board | optical tape |
| direct dial pot | magnetic disc |

Test Method (choose 1 or more)

- Load line, 300V, 0.5A
- Forced Function, prog. 0-20V, 100ma
- Forced function, prog. 0-35V, 100ma
- Forced function, prog. 0-250V, 50ma
- Forced function, prog. 0-150ma, 20V

Accessories and Output Equipment

(choose as many as you wish)

- | | | |
|----------------------------|-----------------|----------------|
| Multiplex queing stations | Bin selector | IBM card punch |
| Test lights | Tape perforator | IBM typewriter |
| Bin lights (10 matrix lev) | A- D converter | Tape printer |
| Lo-go-hi 2 limits | Bin counter | Test counter |

After Dinner Snacks
ARE AVAILABLE AT ANY TIME,
ALSO COMPLETE DINNERS
TO YOUR ORDER!
(For additional details consult the
maitre d', your L&M engineer)



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IN THE CENTER



RING



PLACE AND SOLDER

A new system designated HPS-100 from **Hughes Aircraft Company**, Oceanside, California, automatically feeds flat pack I.C.'s from a magazine, then places and bonds them on a P.C. board by reflow soldering. The machine will attach 6 flat packs per minute.

Technician is shown here changing template that aids positioning of

board. The magazine accepts standard flat packs. XY table has travel of 6 inches by 12 inches. Magazine and soldering head can be rotated 90 degrees to align I.C. leads with either axis.

The new HPS-100 automatic I.C. handling makes possible achievement of high density advantages of flat packs at minimum assembly cost.

WELDING-SOLDERING-POSITIONING

Hughes Aircraft Company announces their Model HXY-510 Numeric Control Welding/Soldering System.

A fully automatic two axis table (10 x 10 travel) with N/C control giving simple programming yet versatile random movement for assembly of hybrid circuits or bonding flat packs to P.C. boards. Table and

controls provided are applicable to virtually any precision metalworking or electrical assembly application. Readily adaptable for use with Hughes' new flat-pack placing and soldering systems. Our most versatile system includes:

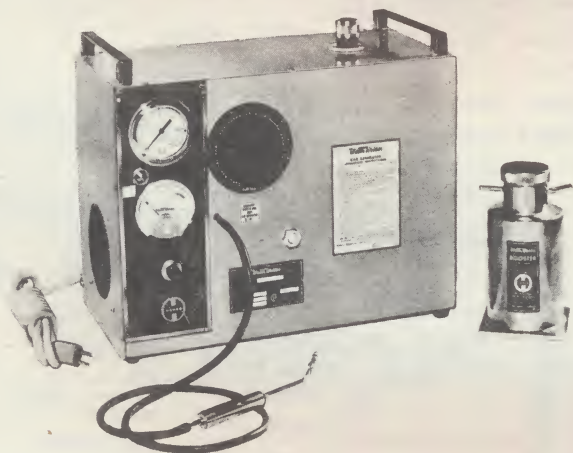
Hughes NC-221 type 2 axis numerical control.

Hughes 10 by 10 inch slide table complete with high precision lead-screws and NC compatible driving mechanisms installed.

Hughes MCW type welding/re-flow soldering equipment including dynamic regulating power supply, bonding head and actuator, Binocular microscope viewing aid.

Complete System integration including optional bench-top or free standing table mounting.

Detailed data and information is available from your nearest **L & M** office. Ask for the 10-page bul-



The famous Henes
Oxy-Hydrogen Flame Generator.

Henes Oxy-Hydrogen Flame Generators make tough jobs easy—for an operating cost of less than 2¢ per hour! These ideal production and lab tools generate their own gas by dissociating distilled water to provide you with a precise, economical heat source of 6000°F.

ALMOST LIMITLESS APPLICATIONS. Now improved for even greater convenience and economy, the Henes Flame Generator can: ■ weld resistance wire to copper ■ butt-weld the finest wires ■ braze contacts to relay blades ■ fuse tungsten to nickel ■ solder relay cans to headers ■ strip wires of Teflon, nylon, or ceramic insulation ■ anneal spring wires and blades ■ drill holes in quartz, ceramic, tungsten, glass ■ weld chromel and alumel wires ■ solder broken welds in electronic modules ■ fuse glass and quartz parts ■ polish glass, quartz, ceramics ■ solder coaxial connectors. (Your own needs will suggest other applications.)

WELD SOLDER BRAZE for less than... 2¢ per hr.



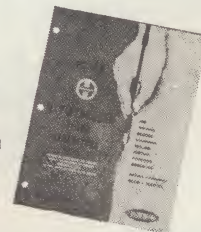
Precision flame adjusts from .003" to .042" in diameter and from .01" to 6" long.

As well as:

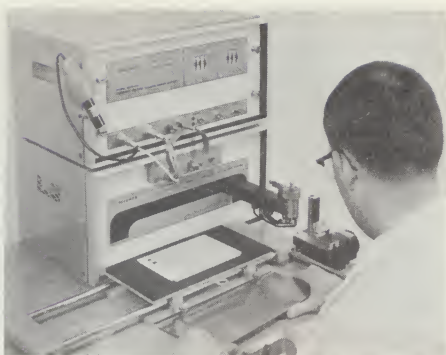
- DRILL ■ CUT
- POLISH ■ ANNEAL

all types of ... METALS PLASTICS
CERAMICS GLASS

FREE! Send for the new brochure which tells the complete story of Henes Oxy-Hydrogen Flame Generators. Five models available from \$250 to \$725 FOB Phoenix, Ariz.



HENES MANUFACTURING CO.
4301 E. Madison St., Phoenix, Ariz. 85034, Ph. 602/275-4126



let in describing Welding/Soldering/ Positioning Systems.

FLUTTER AND WOW

The Model 8100 Flutter Meter is widely used on production lines and in the laboratories of leading manufacturers. It measures precisely to both NAB (National Association of Broadcasters) and DIN (Deutsche Industrie Normen) standards. Both drift and flutter are independently indicated on large, accurate meters.

Test Frequency: 3.0 kHz $\pm$ 10%
Flutter Bandwidth:

.2 to 200 Hz unweighted
.2 to 200 Hz NAB or DIN weighted

Drift Ranges: $\pm$.03%, .1%, $\pm$ 3%, 1%, 3, and $\pm$ 10% full scale.

Flutter Ranges: .01%, .03%, .1%, .3%, 1, 3 and 10% full scale.

Indication is $\pm$ peak or rms.

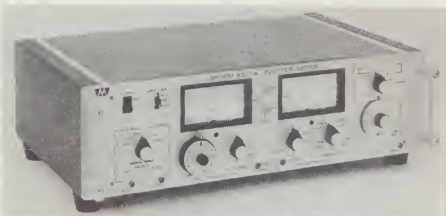
Accuracy on all Ranges:
 $\pm$ 2% at demodulator output
 $\pm$ 5% full scale meter indication

Input Levels: 5 mv to 5 V rms. accepted in two ranges.

AGC and Limiting: Accommodates -20dB dropouts plus a 40dB dynamic range.

Automatic indication of under or over range input.

The MICOM Model 8100 can accurately measure flutter to the 5 ppm level.



The Model 8100-W includes a wave analyzer tuneable from 0.5Hz to 600Hz in 3 overlapping ranges. The wave analyzer is an invaluable diagnostic tool in locating the particular mechanical components contributing to excessive flutter.

Volume 6 No. 3

DISCU-TECH (Continued from page 7)



Bill Drobile, L & M Associates, discussing the Baird-Atomic digitube with John Devenny and Albert Watson of RCA.



Buzz Rollin, Hughes Aircraft, demonstrating the HPS-100 Placer and Solder machine to Bela Musits of IBM and Joseph Tinari of Vector. Len Blakely of L & M is learning too.



Emanuel London and J. Hanchrow of Western Union examining the Marconi 1099 Sweep Generator as demonstrated by Marty Silver of L & M Associates.



Ferdí Delgado, John Taylor and Damar Wadlington of Marconi Instruments . . . Shall we Dance? (Continued on page 12)

Those of you who are owners or users of **Telequipment** oscilloscopes will be interested to learn that **Telequipment, Ltd.**, has been sold to **Tektronix Inc.**, Oregon, U.S.A. Telequipment was formerly handled by **Data Instruments**, Pennsauken, N. J.

NOW! AMCI EASYMATCHES*



a versatile tool
for your
microwave
laboratory

AMCI Easymatches are adjustable matching networks for HF, VHF and microwave frequencies. Available in 14 models, providing continuous frequency coverage from 8MHz to 18GHz, Easymatches may be used to modify an approximate match into a perfect match or create a deliberate mismatched condition.

The matching ability, regardless of phase, is greater than 1.1 to 1 over the frequency range of each model. SWR's higher than 1.3 to 1 can be matched near the center frequency.

An Easymatch combined with an AMCI Instrument Load, carefully adjusted and locked, will produce a perfect load which may be used as a laboratory calibration standard.

Extremely high isolation at a fixed frequency, or over very narrow frequency bandwidths, may be obtained by coupling an Easymatch with an AMCI Hybrid.

*EASYMATCH is a registered trademark. For more information, write for bulletin 711.



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Series 5050 Proximity Voltmeters provide a new dimension in voltage measurement. Exclusive Victorreen Dynamic Capacitor Detector Probes allow non-contacting voltage measurement from 1 volt to 3000 volts fullscale. Accuracies of better than 1% can be achieved. 100% feedback operation provides maximum insensitivity to variations in spacing between probe and surface.

FEATURES

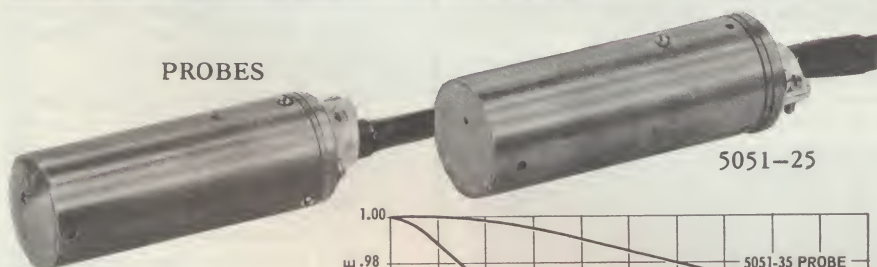
- Small Non-Contacting Probe
- Dynamic Capacitor Detection
- Unequalled Resolution and Sensitivity
- Fast Response
- Low Noise Brushless Probe Design
- Solid State Construction

MEASURES

- Contact Potential of Metals
- Surface Potentials on Plastics, Paper, Fabrics, Semiconductors; in fact, any Insulating or Conducting Materials
- Surface Potential Distribution
- Accumulation Rate and Total Electrostatic Charge

DYNAMIC CAPACITOR PROBES

PROBES



THE VICTOREEN INSTRUMENT COMPANY

10101 Woodland Avenue, Cleveland, Ohio 44104

DISCU-TECH (Continued from page 11)



Dick Pouliot of Alford Mfg. Co., demonstrating the impedance measuring test set to Richard Palker of Sanders Associates, Plainview, L.I.



Alan Stansbury, Quan-Tech Labs., demonstrating noise equipment to Harold Kaye and Hank Shapiro, Litton Industries, White Plains.



"If you think Welding Workshop is all fun - you're mistaken" Dee Blough, Hughes Aircraft



John VanBeuren, President and Brian Whitlock, Sales Engineer, commiserating in front of the Quan-Tech booth.



Bill Buck explains the programmable attenuator to Derek Judd; Chairman, English Electric, U.S.A., and Gordon Pope; Director of Advance, manufacturers of the Xetex line of counters.

This month's Ringmaster is **Alan Spencer**, Applications Engineer, for **Marconi Instruments**, Englewood, New Jersey.

Alan graduated **Birmingham University** with a Bachelor of Science degree in Electrical Engineering in 1958. The year he graduated he went to work for **Marconi Instruments** in **St. Albans, England**, as a graduate apprentice which afforded the opportunity to work in different departments at the St. Alban's plant. At the same time he received additional graduate studies at the **Marconi College**. In 1960 **Alan** was instrumental in the design of transistorized oscilloscopes which were later marketed by **Marconi**. In 1962 **Alan** left the company to pursue his avocation, painting. He studied for a year at the **St. Martin's School of Art** in **London, England**. **Alan** later rejoined **Marconi Instruments** and was assigned to the Applications Department specializing in specific

THIS MONTH'S RINGMASTER



ALAN SPENCER

customer problems involving the use of counters.

He came to the **U.S.** in 1964 armed with this last experience as Applications Engineer to serve **Marconi Instruments**, Englewood, New Jersey in a similar capacity.

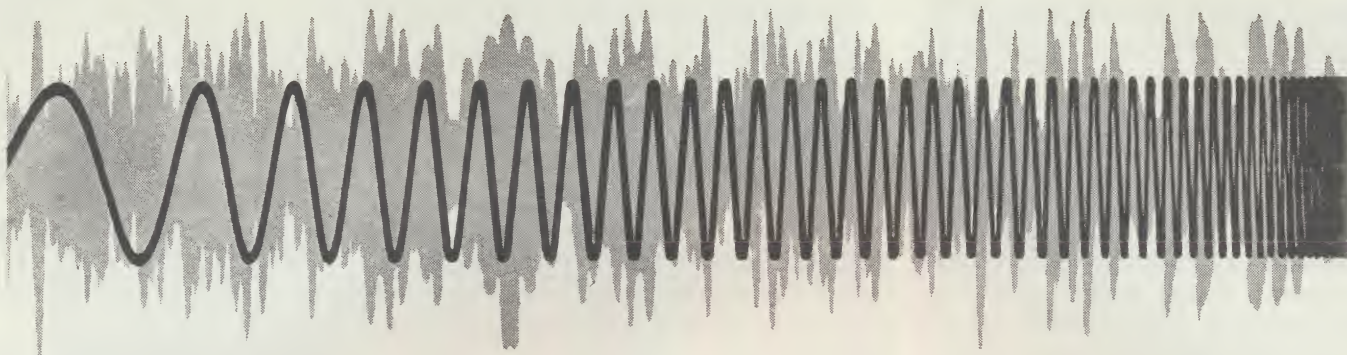
Home for **Alan** is a Bohemian,, Canal Street, apartment, filled with paintings, photographs, and an Afghan Hound. His hobbies also include making 16mm movies and designing and building furniture.

NEW!

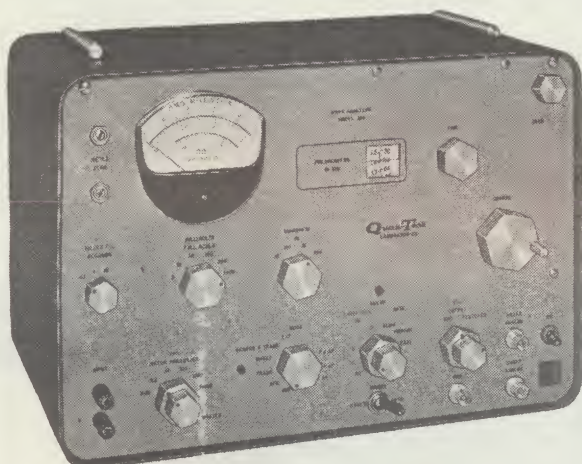
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NEW TRACKING WAVE AND SPECTRUM ANALYZER!
MODEL 305**



It may be hard to believe that all these functions can be performed by one modestly priced instrument, but radically new designs and the use of integrated circuits permit this compact unit to combine the accuracy and measuring capabilities of much larger, more complex and costly systems. Selectable sweep rates, bandwidths, sweep and tracking increments, and averaging times all combine to make the Model 305 the most versatile instrument of its kind.

Whether your application is vibration analysis, underwater sound, bio-medical research, or more conventional measurements, it will pay you to investigate the new Model 305.

FOR ONLY \$2550 YOU GET:

- A Wave Analyzer (For Harmonic, Fourier, and Spectral Density Analysis)
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- A Signal Generator (Sine wave at the frequency to which the analyzer is tuned)
- A Tracking Filter (Tracks a moving signal. No separate reference frequency required)
- A Search and Track Filter (Searches for and tracks a signal)
- Multiple Channel Capability (up to ten units may be connected together as a phase locked system*)
- Phase Measurements (one or more units can measure phase characteristics and transfer functions*)

ABBREVIATED SPECIFICATIONS

Frequency Range: 10 Hz to 50 KHz.

Bandwidths: 10, 100, and 1000 Hz, also broadband 10 Hz to 65 KHz.

Sensitivity: 30 microvolts full scale to 600 volts.

Tuning Modes: Manual, Manual plus AFC, Track, Sweep, Search and Track, External.

Outputs: BFO and Restored Signal; DC analogs of meter reading, frequency and phase.

* Accessory Model 1305 Slave Filter and Phasemeter. In multi-channel installations where the slaved units never need to work independently, we recommend the Model 1305 which has a built-in phase meter but no tuning or sweep features. Mechanical impedance and transfer function analysis is simplified and at a considerable saving in cost.

Refer to E.E.M. for complete Quan-Tech catalog and your nearest representative.

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